NUMBERS & NEEDS IN LOCAL GOVERNMENT
Civil engineering – the critical profession for service delivery
Numbers and Needs

Service delivery -
the public sector challenge!
• Population served ~ 14 million

• Civil engineering professionals ~ 2500 +

• 21 + civil staff per hundred thousand population
<table>
<thead>
<tr>
<th>Non-income generating residential infrastructure</th>
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<th>Infrastructure to support commercial, industrial and economic development</th>
<th>Operations</th>
<th>Maintenance</th>
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Functions performed
- Population served ~ 47 million
- Civil engineering professionals ~ 1300 +
- ~2.8 civil staff per hundred thousand population
Civil engineering staff in 2005
Distribution per typology

- **Districts**
  - Population ~ 32m
  - Districts (2005)

- **Topology 1**
  - Population ~ 4.5m
  - No established towns (2005)

- **Topology 2a**
  - Population ~ 6m
  - Small towns – former TBVC states (2005)

- **Topology 2b**
  - Population ~ 10m
  - One or more small towns (2005)

- **Topology 3**
  - Population ~ 10m
  - Large urban areas (2005)

- **Topology 3**
  - Population ~ 10m
  - Large urban areas (2007)

- **Topology 4**
  - Population ~ 15m
  - Metros (2005)

- **Topology 4**
  - Population ~ 15m
  - Metros (2007)

- **Major cities**
  - Botswana
  - Lesotho
  - Namibia
  - Swaziland

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Successful international local authorities

Bar chart showing civil staff per 100,000 population across different population brackets for South Africa (2007), English-speaking and Scandinavian countries (2007), and South Africa – main centres (1989). The chart highlights the variation in staffing levels across different population sizes.
In SA our challenges are similar

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As a result

- Decisions not made or inappropriate decisions made
- No holistic or long-term planning
- Bulk services inadequate
- Designs inadequate
- Contracts not managed
- Systems not in place or maintained
- Processes not in place or enforced
Numbers and Needs

It is time to rebuild engineering capacity, or outsource / privatise.
But both require capacity!
Restructuring should not be seen as means for reducing technical capacity!

In 66AD Petronius Arbiter wrote:

*We trained hard, but it seemed every time we were beginning to form up into teams we would be reorganised... I was to learn later in life that we tend to meet any new challenge by reorganising ... what a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralisation...*
## Functions needed

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The way things were
The way they are now

Numbers and Needs in Local Government: Civil Engineering – the critical profession for service delivery – November 2007
The balance needed for oversight
Oversight functions if outsourcing

**LOCAL GOVERNMENT**
- **Municipality as Client**
- **Forward Planning**
- **Design Specs**
- **Outsourcing Agreement**
- **Finance**
- **Construct**
- **Maintain**
- **Operate**

**PUBLIC SECTOR**
- **Techneclical Staff for Strategic & Oversight Functions**
- **Municipality’s Own Funds**
- **Technical Staff to Manage Concession Agreement**

**NATIONAL GOVERNMENT**
- **Grants**

**PRIVATE SECTOR**
- **Detail Planning**
- **Design**
- **Document**
- **Finance**
- **Construct**
- **Maintain**
- **Operate**

- **Concessionaire as Consultant**
- **Concessionaire as Financier**
- **Concessionaire as Contractor**
- **Concessionaire as Operator**

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Numbers and Needs in Local Government: Civil Engineering – the critical profession for service delivery – November 2007
Engineering influence reduced

- City Engineers replaced with Technical Services Directors
- Technical Director at same level as heads of support departments
- Large number of inexperienced engineering technicians
- Loss of authority
- Many Technical Services Directors non-technical
Bleeding has taken place for a long time
The formula for rebuilding the civil engineering team

\[ N_h = 1 + \text{ROUND}\left(\frac{N}{5\,000} \times \frac{\Sigma \text{CEF}}{9}\right) \]

\( N = \) number of households, and 

\( \Sigma \text{CEF} = a + b + c + d + e + f + g + h + i \)

(the sum of the civil engineering functions performed in a municipality)

Score 1 for each of ‘\(a\)’ to ‘\(i\)’ if the following functions are performed or 0 for each function that is not the responsibility of the municipality

\(a\) = planning (every municipality should perform a planning function!)
\(b\) = road service provision
\(c\) = stormwater service provision
\(d\) = sanitation service provision
\(e\) = solid waste service provision
\(f\) = traffic engineering and transport planning
\(g\) = water service authority
\(h\) = water service provision
\(i\) = has a PMU

If a municipality predominantly supplies dry sanitation and limited water-borne networks, set ‘\(d\)’=1/2.
Numbers and needs – train and attract

The graph illustrates the capacity in numbers and needs for local government from 2004 to 2012, with various factors influencing the capacity. The key factors and their color codes are as follows:

- **Red**: Retired back to transfer skills and support change
- **Purple**: Introduce students and graduates on 3 to 5 year training contracts
- **Light Purple**: Encourage experienced staff to return
- **Light Blue**: Returning diaspora
- **Gray**: Immigrants
- **Blue**: Net increase entering from private sector, due to reduction in losses <42
- **Green**: Entering from other sectors (excluding private and local government)
- **Dark Green**: Graduates entering
- **Light Green**: In local government from 2004 <42
- **Dark Green**: In local government from 2004 42+
- **Orange**: Reduce leaving for private sector 42+
- **Brown**: Reduce leaving for other sectors
- **Yellow**: Loss due to premature death
- **Pink**: Reduce emigration
- **Brownish Red**: Stop early retirement
- **Pinkish Red**: Retirement

The years covered are 2004 to 2012, with the capacity changes depicted for each year.
Need to rebuild organograms including career pathing

- Engineers
- Technologists
- Technicians
- Superintendents
- Foremen
- Artisans and operators
- Artisans assistants
- Labourers
• Chief Engineer
• Develop meaningful organograms and job descriptions
• Return support to line departments
• Identification of engineering work (IDoEW)
• Develop competency framework
• Recognise ECSA registration and support retention of registration
• Attract those back that have left
Equity – realistic gender targets

**Engineer**

**Technologist**

**Technician**

### Percentage targets for female civil professional staff, per age group

<table>
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<tr>
<th></th>
<th>Trainees and junior staff</th>
<th>Production staff</th>
<th>Managers</th>
<th>Directors and advisors</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>20%</td>
<td>10%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>30 – 37</td>
<td>20%</td>
<td>10%</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>38 – 45</td>
<td>20%</td>
<td>10%</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>&gt; 45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engineer</strong></td>
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<tr>
<td><strong>Technician</strong></td>
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Equity – realistic transformation targets

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<tr>
<td>30-37</td>
<td>75%</td>
<td>40%</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>38-45</td>
<td>80%</td>
<td>50%</td>
<td>40%</td>
<td>20%</td>
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Percentage targets for black civil professional staff, per age group
Re-engineer departments

Dedicated team required to manage the redevelopment of:

• Growth and development strategies
• Master plans
• Systems
• Processes including operations and maintenance
• Policies
• Job descriptions
• Training programmes
• Skills base
Numbers and Needs

Develop the next generation – offer bursaries, experiential and workplace training
Career guidance – civil engineering ND students, 2005

Students per municipality

- 0
- 1
- 2
- 3 – 5
- > 5

DMAs

Centres with tertiary institutions offering civil engineering
The skills acquisition pyramid

**EXPERT**
- Spontaneously does what works
- Unconscious decision making
- No need to analyse or compare alternatives

**PROFICIENT**
- Recognises what needs to be done but not how to do it
- Conscious decision making – must decide how
- Problem solving using multiple real world experiences

**COMPETENT**
- Number of rules become excessive
- Learn principles of perspectives
- Perspectives developed by sorting information by relevance
- Involved in and feels the responsibility of decision making

**ADVANCED BEGINNER**
- New situational elements are identified
- Rules begin to be applied to related conditions
- Decisions are made by maxims
- Detached – does not take personal responsibility

**NOVICE**
- No previous experiences
- Follows rule – specific rules for specific circumstances with no alternatives
- No contextual understanding
- Detached – does not feel responsible other than following the rule
The project cycle – skills to be acquired

Engineering and re-engineering
- Receive brief
- Planning
- Design
- Drawing
- Detailing
- Quantities
- Draw up tender
- Tender

Develop new brief
- Adjudicate & award tender
- Fabrication
- Construction
- Commissioning
- Operating
- O&M & as builts

Upgrade
- Repair
- Maintainance
- Operation
- Handover

Operations and maintenance
Guided learning

Active learning

Passive reception

Increasing cultivation of wisdom

Learning by doing through guided experience
- guided practice
- guided observation
- guided problem solving
- guided experimentation

Socratic questioning

Stories with a moral

Rules of thumb

Directives/presentations/lectures
Great progress ....

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ENERGYS Team – it can be done!
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